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SOYDATA

GLYCIM Validation Data Sets

January 2000

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1. General information

GLYCIM is a soybean crop simulator. Validation data sets have been collected to test the performance of the simulator, to estimate parameters specific for particular cultivars, and to provide data for testing modified versions of the code.

Each validation data set includes a set of GLYCIM input data files developed for a particular crop, and data on crop development collected during the growing season. A set of GLYCIM input files consists of five files (1) weather file, (2) soil file, (3) initialization file, (4) cultivar file, and (5) irrigation file. Data on crop development include progress of vegetative and generative stages, plant height, stem weight, pod weight, leaf weight, and yield. Both values of measured crop development variables and standard deviations of measured values are stored. All data are presented as ASCII files, and files of similar data are grouped in subdirectories which in turn are within the directory **\soydata**.

Subdirectory **\soydata\descriptor** contains descriptions of the data sets. File **\soydata\descriptor\descriptor.txt** lists all data available. As shown in Table 1, the number of a data set, year, location of the site, soil name, soybean variety planted, and irrigation technique are listed in this file. File **\soydata\descriptor\glyruns.txt** lists GLYCIM input data files for each data set. It is shown in Table 2. Names of weather data file, soil data file, crop data file, cultivar data file, and irrigation data file are given. File **\soydata\descriptor\abbrevar.txt** lists soybean varieties in crops that were studied. The abbreviation and some information on the variety is given.

Subdirectory **\soydata\weather** contains weather data files.

Subdirectory **\soydata\soil** contains soil data files.

Subdirectory **\soydata\initials** contains initialization data files.

Subdirectory **\soydata\irrigate** contains initialization data files.

Subdirectory **\soydata\variety** contains cultivar data files. The files that do not have the latter ?n? in the end of their names are not reliable.

Subdirectory **\soydata\observ** contains crop development data files.

Subdirectory **\soydata\obsstat** contains standard deviation data files which contain standard deviations of crop development variables in observations.

Table 1. List of the GLYCIM validation data sets

Set #	Year	Location	Soil	Variety	Irrigation
1	93	Clark farm	Dundee	14	NKS5960 FU
2	93	Clark farm	Sharkey	11	NKS5960 FU
3	93	Clark farm	Forrestdale	6	NKS5960 FU
4	93	Hester farm	Sharkey	8	Pio9593 FU
5	93	Hester farm	Dundee	18	Pio9593 FU
6	93	Hester farm	Dundee	19	Pio9501 FU
7	93	Hester farm	Sharkey	8	AS 5979 FU
8	93	Hester farm	Sharkey	11	As 5979 FU
9	93	Hood farm	Sharkey	9	DPL 415 SP
10	93	Mullens farm	Sharkey	7	Hutches FU
11	93	Verona	Ora	2ss	TRG 515 NO
12	94	Clark farm	Forrestdale	6	Pio9592 FU
13	94	Hester farm	Dundee	19	Pio9501 NO
14	94	Hester farm	Sharkey	12	AS 5979 NO
15	94	Hood farm	Sharkey	9	DPL 415 SP
16	94	Mullens farm	Dundee	23	Hutches FU
17	94	Mullens farm	Dundee	22	Hutches FU
18	94	Mullens farm	Forrestdale	8	Hutches FU
19	94	Mullens farm	Dundee	22	Hutches NO
20	94	Dickerson farm	Dundee	24	TRG5452 FU
21	94	CropSimResUnit	Marietta	2	NKRA452 FU
22	94	CropSimResUnit	Marietta	2	Pio9444 FU
23	94	CropSimResUnit	Marietta	2	Riv_499 FU
24	94	CropSimResUnit	Marietta	2	Pio9501 FU
25	94	CropSimResUnit	Marietta	2	AS_4715 FU
26	94	CropSimResUnit	Marietta	2	AS_5979 FU
27	94	CropSimResUnit	Marietta	2	Pio9592 FU
28	94	CropSimResUnit	Marietta	2	TRG5452 FU
29	94	CropSimResUnit	Marietta	2	Hutches FU
30	94	CropSimResUnit	Marietta	2	Riv9094 FU
31	94	CropSimResUnit	Marietta	2	Pio9641 FU
32	94	CropSimResUnit	Marietta	2	Tenn690 FU
33	94	CropSimResUnit	Marietta	2	TRG6633 FU
34	94	CropSimResUnit	Marietta	2	Riv_699 FU
35	94	CropSimResUnit	Marietta	2	Young FU
36	94	Verona	Ora	2ss	TRG 515 NO
37	95	Bragg farm	Abern	1	DPL 415 SP
38	95	Bragg farm	Decatur	5	DPL 415 SP
39	95	Bragg farm	Decatur	6	DPL 415 SP
40	95	Hester farm	Sharkey	12	Pio9592 FU
41	95	Hester farm	Sharkey	12	NKS5960 FU
42	95	Hester farm	Bosket	4	Pio9501 NO
43	95	Hester farm	Bosket	4	DPL3478 NO
44	95	Hester farm	Dundee	12	Pio9501 FU
45	95	Hester farm	Dundee	12	DPL3478 FU
46	95	Hood farm	Sharkey	9	DPL 415 SP
47	95	Hood farm	Robinsonvill2		DPL 415 NO

48	95	Hood farm	Robinsonville	2	DPL 415	SP
49	95	Madison farm	Commerce	14	Pio9592	SP
50	95	Madison farm	Commerce	14	Pio9592	NO
51	95	Madison farm	Hati		Hutches	FU
52	95	McCain farm	Alligator	3	Har5164	FU
53	95	McCain farm	Dubbs	8	AS_5885	FU
54	95	Mullens farm	Dundee	22	Hutches	FU
55	95	Mullens farm	Dundee	23	Hutches	FU
56	95	Mullens farm	Forrestdale	8	Hutches	FU
57	95	Mullens farm	Dundee	22	Hutches	NO
58	95	Nelson farm	Memphis	5	DPL 415	NO
59	95	Nelson farm	Memphis	5	DPL 415	NO
60	95	Nelson farm	Memphis	5	DPL 415	NO
61	95	Nelson farm	Memphis	5	DPL 415	NO
62	95	Nelson farm	Memphis	5	DPL 415	NO
63	95	Nelson farm	Memphis	5	DPL 415	NO
64	95	Nelson farm	Memphis	5	DPL 415	NO
65	95	Nelson farm	Memphis	5	DPL 415	NO
66	95	Ragsdale farm	Sharkey	12	Pio9501	FU
67	95	Wilder farm	Adler	3	AS_5979	SP
68	95	Wilder farm	Adler	3	AS_5843	SP
69	96	Bragg farm	Cookville	1	dpl_415	SP
70	96	Hood farm	Sharkey	9	dpl_415	SP
71	96	McCain farm	Dubbs	8	asg5885	FU
72	96	McCain farm	Alligator	3	Har5164	FU
73	96	Ragsdale farm	Sharkey	8	Pio9501	FU
74	96	Wilder farm	Adler	3	Asg5843	SP
75	96	Wilder farm	Adler	3	Asg4922	SP
76	97	Bragg farm	Decatur	6	Hutches	SP
77	97	Gandy fram	Loring		Manokin	SP
78	97	McCain Farm	Dubbs	8	Asg4715	FU
79	97	McCain farm	Dubbs	8	Asg4922	FU
80	97	McCain farm	Dubbs	8	DPL3478	FU
81	97	Hardwick farm	Sharkey	12	Asg5901	SP
82	97	Ragsdale farm	Sharkey	12	Pio9501	FL
83	97	Hester farm	Sharkey	12	DPL3588	FU
84	97	Hood farm	Sharkey	9	NK_6503	SP
85	97	Mullens farm	Sharkey	7	Hutches	FU
86	97	Satterfield	Sharkey	6	Asg5901	FU
87	97	Madison fram	Commerce	14	Hutches	SP
88	97	Watkins farm	Hati		Asg4922	SP
89	97	Watkins farm	Dundee	12	Asg4922	NO
90	97	Wilder farm	Adler	3	Har5088	SP
91	95	Garnett field	Lanton		Sti4390	NO
92	95	Garnett field	Woodson		Sti4650	NO
93	91	Hood farm	Commerce	14	DPL 415	FU
94	92	Hester farm	Sharkey	8	Pio9592	NO(weather file)
95	92	Hester farm	Dubbs	7	Asg5979	NO(weather file)
96	98	Bragg farm	Decatur	6	Stonewal	SP
97	98	Harris farm	Loring		Har5545RR	SP
98	98	Hood farm	Sharkey	9	Har4501RR	SP
99	98	Madison farm	Commerce	14	Clifford	SP
100	98	Wilder farm	Adler	3	As4701RR	SP

101	99	Hester farm	Sharkey	6	DP3478	FU
102	99	Hester farm	Sharkey	6	DP3588	FU
103	99	Hester farm	Sharkey	6	DP3640	FU
104	99	Hester farm	Sharkey	6	DP4344	FU
105	99	Hester farm	Sharkey	6	DP4909	FU
106	99	Hester farm	Sharkey	6	DP5354	FU
107	99	Hester farm	Sharkey	6	DP5655	FU
108	99	Hester farm	Sharkey	6	DP6200	FU
109	99	Hester farm	Sharkey	6	DP6880	FU
110	99	Hester farm	Sharkey	6	DP3478	FU
111	99	Hester farm	Sharkey	6	DP3588	FU
112	99	Hester farm	Sharkey	6	DP3640	FU
113	99	Hester farm	Sharkey	6	DP4344	FU
114	99	Hester farm	Sharkey	6	DP4909	FU
115	99	Hester farm	Sharkey	6	DP5354	FU
116	99	Hester farm	Sharkey	6	DP5655	FU
117	99	Hester farm	Sharkey	6	DP6200	FU
118	99	Hester farm	Sharkey	6	DP6880	FU
119	99	Hester farm	Sharkey	6	DP3478	FU
120	99	Hester farm	Sharkey	6	DP3588	FU
121	99	Hester farm	Sharkey	6	DP3640	FU
122	99	Hester farm	Sharkey	6	DP4344	FU
123	99	Hester farm	Sharkey	6	DP4909	FU
124	99	Hester farm	Sharkey	6	DP5354	FU
125	99	Hester farm	Sharkey	6	DP5655	FU
126	99	Hester farm	Sharkey	6	DP6200	FU
127	99	Hester farm	Sharkey	6	DP6880	FU
128	99	Hood farm	Robinsonvill2	DP3478	SP	
129	99	Hood farm	Robinsonvill2	DP3588	SP	
130	99	Hood farm	Robinsonvill2	DP3640	SP	
131	99	Hood farm	Robinsonvill2	DP4344	SP	
132	99	Hood farm	Robinsonvill2	DP4909	SP	
133	99	Hood farm	Robinsonvill2	DP5354	SP	
134	99	Hood farm	Robinsonvill2	DP5655	SP	
135	99	Hood farm	Robinsonvill2	DP6200	SP	
136	99	Hood farm	Robinsonvill2	DP6880	SP	
137	99	Hood farm	Robinsonvill2	DP3478	SP	
138	99	Hood farm	Robinsonvill2	DP3588	SP	
139	99	Hood farm	Robinsonvill2	DP3640	SP	
140	99	Hood farm	Robinsonvill2	DP4344	SP	
141	99	Hood farm	Robinsonvill2	DP4909	SP	
142	99	Hood farm	Robinsonvill2	DP5354	SP	
143	99	Hood farm	Robinsonvill2	DP5655	SP	
144	99	Hood farm	Robinsonvill2	DP6200	SP	
145	99	Hood farm	Robinsonvill2	DP6880	SP	
146	99	Hood farm	Robinsonvill2	DP3478	SP	
147	99	Hood farm	Robinsonvill2	DP3588	SP	
148	99	Hood farm	Robinsonvill2	DP3640	SP	
149	99	Hood farm	Robinsonvill2	DP4344	SP	
150	99	Hood farm	Robinsonvill2	DP4909	SP	
151	99	Hood farm	Robinsonvill2	DP5354	SP	
152	99	Hood farm	Robinsonvill2	DP5655	SP	
153	99	Hood farm	Robinsonvill2	DP6200	SP	

154 99 Hood farm Robinsonvill2 DP6880 SP

2. File formats

Below we present formats that were in use at the end of '97.

2.1. Weather data

The first line contains a comment line ?H24'

Each following line contains the following variables:

JDAY - day of year - Julian date,

DATE - characters denoting date, mm/dd,

RI - daily solar radiation integral, langley,

TMAX - maximum air temperature during the day, °F,

TMIN - minimum air temperature during the day, °F,

RAIN - rainfall, inch day⁻¹,

WIND - wind run at 2 meters, miles per day.

Numbers and characters are written in free format, spaces are used as separators.

An example of the beginning and of the end of a weather file:

1 '01/01' 50.0 49.0 41.0 0.26 109.9

2 '01/02' 54.0 46.0 42.0 0.00 61.7

3 '01/03' 62.0 44.0 37.0 0.02 175.2

.....

363 '12/28' 68.0 53.0 44.0 0.10 227.4

364 '12/29' 34.0 45.0 43.0 0.12 184.0

2.2. Soil data

Line # 1 is a comment line which contains string of two character variables both enclosed in apostrophes. Line # 2 contains variable LYRSOL = number of soil layers considered. Lines # 3, # 4, and # 5 contain altogether 26 numbers, the last of which has to be integer. These numbers are not used in GLYCIM. Then follow one or more groups of three lines each, one group per soil layer.

The first line in a group contains:

SDEPTH = maximum depth of soil in the layer, cm,
 DIFF0 = soil hydraulic diffusivity at a soil water potential of -15 bars, $\text{cm}^2\text{day}^{-1}$,
 THETA0 = volumetric water content at a soil water potential of -15 bars, $\text{cm}^3\text{cm}^{-3}$,
 BETA = slope of graph of log (hydraulic conductivity) vs. volumetric water content
 THETAS = volumetric water content of soil in the layer at saturation, $\text{cm}^3\text{cm}^{-3}$.

The second line in a group contains:

FCI = volumetric water content at field capacity, $\text{cm}^3\text{cm}^{-3}$,
 AIRDR = volumetric water content of air dry soil in the layer, $\text{cm}^3\text{cm}^{-3}$,
 BD = bulk density of soil in the layer, g cm^{-3} ,
 ETA = a soil characteristic parameter relating volumetric water content to water potential,
 SCOND = saturated hydraulic conductivity of soil in the layer, cm day^{-1} ,
 PSISAT = water potential of soil in the layer at which air starts to enter the saturated soil, bars.

The third line in each group contains:

SAND = sand content of the layer as a percentage of soil dry weight,
 CLAY = clay content of the layer as a percentage of soil dry weight,
 POINTR = an arbitrary integer number.

Numbers and characters are written in free format, spaces are used as separators.

An example of a soil data file:

```
'SHARKEY7.HYD' 'Sharkey silty clay loam,Mullens,CoahomaCo.,MS 1992'  

2  

.87E-03 .26E+00 .46E+02 .53E+00 .31E+00 .20E+00 .10E+01 3.10E+00 2.83E+00  

.87E-03 .262E+00 .46E+02 .53E+00 .31E+00 .20E+00 .10E+01 3.10E+00 2.83E+00  

.46E+02 .50E+00 .00E+00 .10E+01 -.33E+00 -.01E+00 999 2147105274  

20 .87560E-03 .26200E+00 .46280E+02 .53600E+00  

.31300E+00 .14340E+00 .10720E+01 3.10E+00 2.834E+00 -.4630E-04  

17 40 2147105274  

201 .18300E-03 .35200E+00 .86340E+02 .50300E+00  

.40200E+00 .28410E+00 .11690E+01 3.17E+00 4.97E-01 -.3374E-02  

16 44 0
```


2.3. Initialization data

First line contains parameters of crop location, timing, spacing, etc:

LATUDE = latitude, degrees,

JDFRST = day of year on which model run starts (=day of emergence),

JDLAST = day of year which model run stops; this is a final termination date and can be preempted by plant maturity or by other event,

ROWSP = row spacing, in,

POPROW = plant population per foot of row,

ROWANG = row orientation measured eastward from north, degrees,

NFRQ = frequency of output required, days,

KTIME = simulated hour of day when variables are to be printed in the GLYCIM report,

CO2 = ambient CO2 concentration, ppm by volume.

The second line contains soil nitrogen data:

RNNO3 = residual nitrogen as nitrate in soil at beginning of season, lb/acre,

RNNH4 = residual nitrogen as ammonium in soil at beginning of season, lb/acre,

FERN = fertilizer nitrogen applied, lb/acre,

FNO3 = fraction of fertilizer nitrogen that is nitrate, %,

FNH4 = fraction of fertilizer nitrogen that is ammonium, %,

OMA = organic matter added to the plow zone at beginning of season, lb/acre.

The third line contains data on soil cell size and number, and on boundary conditions:

NL = number of cell layers in soil profile,

NK = number of cells between rows (must be even),

DEPTH = depth of each soil cell, cm,

PLOWIN = depth to which soil is cultivated, cm,

DIMPL = depth to gas impermeable layer from the soil surface, cm,

TC = temperature of the soil at the lower boundary of soil profile, °C

MSW3 = switch to indicate if initial soil profile water contents are available.

The fourth and following lines accommodate data on initial root distribution:

NLR = number of soil cell layers where roots are present initially

NKR = maximum number of cells in any cell layer where roots are present initially

RTWT = initial root mass, g per soil cell listed in the order ((RTWT(i,j),i=1,NLR),j=1,NKR)

Numbers and characters are written in free format, spaces are used as separators.

An example of the initialization data file:

33.5 130 365 76.2 16.404 345 0 8 350

35 3.5 0 0 0 22000


```
10 10 10 18 200 25 0
6 2 0.0022 0.0018
0.0015 0.0012
0.0009 0.0003
0.0011 0.0009
0.0006 0.0003
0 0
```

2.4. Cultivar data

Files contain an arbitrary number of lines in which the following parameters are given:

MG = maturity group number (group 00 = -1),

SEEDLB = number of seeds per pound weight typical for cultivar,

FILL = seed fill rate at 24°C, mg seed⁻¹day⁻¹,

DET = switch to indicate if plant is determinate (=0 for determinate and =1 for indeterminate),

Following 25 lines contain 25 parameters:

Parameter #	Meaning
1	correction to Pennman equation (usually 1.0)
2	slope of the dependence of VSTAGE on temperature integral, dday-1
3	maximum VSTAGE
4	correction factor for the early V rate to account for clay content
5	progress rate towards R0 at solstice, day-1
6	daily rate of the progress to R0 before solstice, day-1
7	daily rate of the progress to R0 after solstice, day-1
8	progress rate from R0 towards R2, day-1
9	slope of the dependence of R2end on the JDFRST, day-1
10	intercept of the dependence of R2end on the JDFRST
11	progress rate from R2 towards R6, dday-1
12	length of the plateau R5, dday
13	length of the plateau R6 with no stress, dday
14	rate of the decay of the R6 plateau as the stress increases, dday
15	rate of the progress towards R7, dday-1
16	R stage to stop vegetative growth
17	relates potential elongation and dry weight increase of petioles
18	potential rate of the root weight increase
19	relates increase in pod weight and progress in R stages
20	relates increase in seed weight and FILL
21	a in relationship between height and V stages
22	b in relationship between height and V stages
23	relates number of branches with the plant density
24	relates stem weight to stem elongation
25	relates increment in leaf area to increment in vegetative stages

An example of the cultivar data file:

4	3100.00	7.50000	1
1.00000	1		
1.147000E-02	2		
16.0700	3		
1.00000	4		
5.050000E-02	5		
4.780000E-02	6		
-0.195000	7		
0.124000	8		
0.0	9*		
200.0	10*		
5.700000E-03	11*		
86.0000	12		
550.000	13		
1.20000	14		
5.000000E-03	15		
5.0	16*		
2.400000E-03	17		
0.500000	18		
1.20000	19*		
1.00000	20		
1.30000	21		
1.50	22		
0.500000	23		
1.00000	24		
1.00000	25		

2.5. Irrigation data

The first line describes the irrigation technique (sprinkler, furrow, or ponding)The second line shows the total number of irrigations applied.

Each following line shows the date when the irrigation was applied, and the amount of water applied, inches.

Numbers and characters are written in free format, spaces are used as separators.

An example of the irrigation data file is:

```
Furrow
2
08/14/95 3.00
08/27/95 3.00
```


2.6. Crop development data

2.6.1. Mean values

All files have names 'obs*.dat' where the '*' denotes the 3-digit number of the corresponding data set, e.g. '005'. The first and second lines are comment lines. The third and following lines contain values of the following variables:

JDAY = Julian day of observations

PLHT = observed plant height, cm

VSTG = observed vegetative stage

RSTG = observed reproductive stage

LFWT = observed leaf weight, g

STWT = observed stem weight, g

PDWT = observed pod weight, g

Missing values are denoted by '-9.99'

Numbers are written in free format, spaces are used as separators.

An example of the data file with mean data crop development file is:

Data set # 018

JDAY	PLHT	VSTG	RSTG	LFWT	STWT	PDWT
151	3.05	0.00	-9.99	0.10	0.03	-9.99
158	6.51	1.56	-9.99	-9.99	-9.99	-9.99
167	12.54	3.44	-9.99	0.53	0.32	-9.99
171	-9.99	-9.99	-9.99	0.76	0.52	-9.99
172	15.22	4.67	-9.99	-9.99	-9.99	-9.99
179	27.32	6.43	-9.99	1.31	1.19	-9.99
214	82.68	14.37	3.57	5.13	10.38	0.48
221	-9.99	-9.99	4.44	5.69	12.43	1.35
228	-9.99	-9.99	5.06	6.63	14.78	4.68
236	-9.99	-9.99	5.96	6.16	13.58	7.90
250	-9.99	-9.99	6.00	6.36	12.11	20.35
257	-9.99	-9.99	7.02	11.91	10.33	19.28

2.6.2.

Standard deviation values

All files have names 'std*.dat' where '*' denotes the 3-digit number of the corresponding data set, i.g. '005'. The first and second lines are comment lines. The third and following lines contain values of the following variables:

JDAY = Julian day of observations

S_PLHT = standard deviation of observed plant height, cm

S_VSTG = standard deviation of observed vegetative stage

S_RSTG = standard deviation of observed reproductive stage

S_LFWT = standard deviation of observed leaf weight, g

S_STWT = standard deviation of observed stem weight, g

S_PDWT = standard deviation of observed pod weight, g

Missing values are denoted by '-9.99'

Numbers are written in free format, spaces are used as separators.

An example of the standard deviation file content is:

Data set # 019

	JDAY	PLHT	VSTG	RSTG	LFWT	STWT	PDWT
151	0.89	0.00	-9.99	0.00	0.00	-9.99	
158	1.70	0.58	-9.99	-9.99	-9.99	-9.99	
167	2.54	0.84	-9.99	0.12	0.08	-9.99	
171	-9.99	-9.99	-9.99	0.34	0.21	-9.99	
172	3.53	1.10	-9.99	-9.99	-9.99	-9.99	
179	4.20	1.36	-9.99	0.35	0.37	-9.99	
187	6.20	1.71	0.14	-9.99	-9.99	-9.99	
188	-9.99	-9.99	-9.99	0.80	1.02	-9.99	
214	10.63	2.08	0.89	0.96	2.43	0.11	
221	-9.99	-9.99	1.00	2.62	5.96	1.30	
228	-9.99	-9.99	0.49	2.11	4.61	2.01	
236	-9.99	-9.99	0.46	2.36	5.90	4.59	
244	-9.99	-9.99	0.26	1.17	1.79	1.62	
250	-9.99	-9.99	0.52	1.96	2.57	6.25	
257	-9.99	-9.99	0.50	1.93	2.91	6.25	
264	8.42	1.47	0.43	0.28	1.99	7.50	

imation

SOYDATA

1.44MB

formatted for master

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imation



3. TECHNICAL SUPPORT

This data base is created by Basil Acock, Yakov Pachepsky, V. R. Reddy, and Frank Whisler.

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